

# **New Automated Irrigation system**

## **SCOPE OF WORK**

### **PRESIDENTIAL VILLAS COMPOUND**

The Embassy of the United States is looking forward to hire a contractor to furnish and install AUTOMATIC IRRIGATION SYSTEMS at the newly leased compound, Presidential villas. The work shall cover the 40 Villas. By the end of the project, each villa shall be equipped with separate automated irrigation system to fulfill the demands of water supply for its green areas. The grass area shall be irrigated through sprinklers, and the plants through drippers system.

### **SCOPE OF WORK**

The Irrigation Contractor (IC) shall be responsible for the design, provision, installation, and testing of the newly installed automated irrigation system for each unit of 40 units of the Presidential Villas.

- Construction of the automated irrigation system will be in two Phases:
- ✓ Phase I consists of the construction and testing of the Main system manifold from the water source. All fittings and main valves must be installed, tested and properly functioning prior to the second phase.
  - ✓ Phase II consists of providing water from the main network to each of the sprinklers and drippers with suitable Pressure as per US and local codes and standards.

### **AUTOMATIC SYSTEM DESCRIPTION**

Above-ground Automatic controlled irrigation system for each villa with separate Automatic controller and solenoid valves.

### **SUBMITTALS**

#### **Initial Submittals**

Drawings (to be prepared by irrigation contractor): Indicate piping layout to water source, location, coverage of all zones, components, plant and landscaping features, site structures, schedule of outlets and fittings to be used.

Manufacturers' data & specs for the automatic system, its components.

#### **Closeout Submittals**

Project Record Documents (As-built drawings): Record actual locations of concealed components including, but not limited to control valves and piping, sprinkler heads and drippers locations ... etc.

**Operation and Maintenance Data:**

1. Submit instructions for operation and maintenance of system and controls, seasonal activation and shutdown, and manufacturer's parts catalog.
2. Submit schedule indicating period of time each valve is required to be open to deliver specified amount of water.

**QUALIFICATIONS**

- A. Manufacturer: Company specializing in manufacturing high quality products specified with minimum three years documented experience.
- B. Installer: Agriculture Company specializing in execution this type of Work with minimum three years experience and/or approved by manufacturer.

**PRE-INSTALLATION MEETINGS**

- A. Convene one week prior to commencing Phase I and Phase II of the Work described in this section.

**COORDINATION**

- A. Coordinate the Work with installation of automated system should be with Engineers of the embassy to decide appropriate location for controllers.

**INSTALLATION**

- A. Connect to water supply tie-in and pump with automatic switch off and emergency hose will be provided by the embassy.
- B. Use threaded nipples for risers to each outlet.
- C. After piping is installed, but before outlets are installed and backfilling commences, open valves and flush system with full head of water.
- D. Manual controlled Ball Valves: both sides female threaded copper internally filled.

**EXAMINATION**

- A. Verify location of existing utilities.
- B. Verify required utilities are available, in proper location, and ready for use.

C. Verify that source water connections are available, in proper location, and ready for use

**FIELD QUALITY CONTROL**

A. Test system for leakage at main piping to maintain pressure for one hour.

B. System is acceptable when no leakage or loss of pressure occurs during test period.

**DEMONSTRATION AND TRAINING**

A. Instruct embassy personnel in operation and maintenance of system, including adjusting of sprinkler heads. Use operation and maintenance manual as basis for demonstration.

## **Specifications for the system**

- The green lawn area in the back shall be irrigated through five main sprinklers. The spacing between the sprinklers heads is around 15 meters; it is expected to have one sprinkler in the center of the lawn area (360 degree full circle) and four sprinklers at the corners (90 degree arc).
- The shrubs and flower beds in the back and front yard to be irrigated through drippers.
- The irrigation system shall be able to provide the water for all the green area through drippers and the sprinklers.

### **PIPES AND FITTINGS**

#### **1.1 PVC Pipes**

Irrigation pipe shall be PVC pipe SCHEDULE 80. 10 BAR, 1 INCH PIPES for the main line and *for* all laterals.

Pipes shall be supplied in lengths of 6 METERS FOR PVC.

Irrigation mainlines shall have a minimum depth of 45 cm while irrigation laterals shall have a minimum of 30 cm.

#### **1.2 PVC Fittings.**

All Tees and Elbows and adapters shall be made of PVC SCHEDULE 80 10 BAR.

#### **1.3 Polyethylene Pipe and Fittings**

Polyethylene pipes for drip. Shall be low density polyethylene LDPE 13 MM outside dia.

#### **1.4 DRIP LINE**

The tube should be made of virgin LDPE, having an outside diameter of 13mm external emitter (Dripper) that provides a constant discharge over a pressure range of 0.5 bars to 4 bars.

#### **1.5 Drip Emitters**

Wherever required the contractor shall use external online emitter. External Online emitter has to be installed as per the requirements of the system.

All the emitters must be adjustable type. Placement of the emitters is as under:

Ground covers	2 L/H
Flowers	4 L/H
Shrubs	8 L/H

### **2.1 Pumping Unit (to be furnished by the Embassy)**

The pump should be a 1 inch inlet an outlet 1 hp pump with an h.max of 50 m.

An isolation valve shall be installed before and after the pump. Also, there shall be a hose take off valve after the pump for emergency water. The embassy shall furnish the pump only, all other peep hose, valves, and all other equipment shall be furnished and installed by the contractor.

### **2.2 Automatic operation of the Pump**

The pumps are operational and the pumps are cyclic. The sequence will be dealt with high quality automatic controller installed. The pumps start when an irrigation cycle starts.

The pumps installed shall have dry running protection.

### **2.3 Controllers**

The controller shall require 230/240 VAC 50 Hz input power and have 24 VAC power output for operation of solenoid control valves.

The controller shall be with plastic cabinet (outdoor cabinet).

Manual operation of the controller shall be possible at any time.

Permits software selectable restart option after loss of power to the controller.

Water budget for each schedule from 0 – 250% in 5% increments.

### **2.4 Electric Cable for Solenoid Valves**

All electrical wire for underground use shall be "Underground Feeder" type and U.L. Listed. 24 Volts electrical service wires to the solenoid valves shall be comprised of two single standard copper conductors each insulated with a flame retardant thermoplastic compound. 24 Volts wire shall be equal to US standard type U.F. (underground feeder). The minimum cross sectional area of conductor and insulation shall be specified /designed as per voltage drop calculation. Cable markers shall be used for indicating valve numbers and valve sizes for each cable at both ends as well as at splices.

### **2.5 Wire Connections**

All wire connections at electric remote control valves, and all splices of wire in the field shall be made using wire connectors. The wire connectors shall be specifically designed to ensure waterproof underground wire connections. The connectors shall be under-writers laboratories listed water-resistance wire connectors.

### **2.6 (Solenoid) Electric Remote Control Valve (1")**

The remote control valves shall be a normally closed 24 volt A.C. 50 cycle solenoid actuated globe pattern diaphragm type. Valve pressure rating shall not be less than 80 PSI.

The valve body and bonnet shall be constructed of heavy plastic; diaphragm shall be of nylon reinforced nitrile rubber. Solenoid coil shall be one-piece with captured plunger.

The valve shall be actuated by a low power, 2.0 watt 24 volt A.C. solenoid actuator. The solenoid plunger shall have a filter to ensure positive valve operation.

Control water pressure for the solenoid actuator shall be delivered from the inlet of the valve to the actuator by means of an external tube connected to a self flushing nylon screen located in the inlet water passage of the valve. All tube connections will have a quick fit action.

The valve shall have a flow control stem and cross handle for regulating or shutting off the flow of water and a bleed screw for manual operation without electrically.

### **3. 3/4" FEMALE THREADED INLET POP-UP SPRINKLER**

The full or part circle pop-up PGP sprinkler. Spacing in general is 10 m for the sprinklers; at some location it is adjusted to suit the area. The overall pop-up height shall be 10.2 cm (4').

### **6. VALVE BOX**

Solenoid Valves, isolation valves shall be installed in access boxes of sufficient size to permit ready removal of the valve inner assemblies without removing the box from the ground. Valve numbers must be clearly marked inside and outside of the box with a permanent paint or by using plastic tags.

Valve boxes shall be dimensioned as follows:

Solenoid valves dia.1 inch and below, Rectangular. Minimum top external dimensions shall be 640 x 400mm , Minimum depth shall be 380mm

## **Conditions of Contract**

### **1. General**

This is a firm fixed price turnkey job for the entire work and amount quoted shall include all work described in attached drawing, scope of work and general condition of contract. The lump sum price quoted shall be fixed and nothing extra will be entertained on any account.

Contractor's staff is subject to such restriction for entry and exit as are required by the Embassy's security requirement. Contractor's staff will be subject to security cleared as required by the Embassy.

Contractor shall restore all surfaces disturbed by construction to match with existing finish.

Any deviation from the original contract/scope of work shall be informed to COR before work begins. No additional work or changes will be carried out without a contract modification.

### **2. Responsibilities of Contractor**

Contractor shall be responsible for procuring, supplying, transporting, and providing all labor, materials, tools and plant and equipment etc., required for completion of the work in all respects and as per the scope of the work.

All expenses towards mobilization at site and demobilization including bringing in equipment, workforce and materials, dismantling the equipment, clearing the site etc. shall be deemed to be included in the rates quoted by the contractor against various items of schedule of rates and no separate payment on such expenses shall be entertained.

Contractor shall employ and provide one full time engineer to supervise the project and has experienced of carrying out such type of work.

Contractor shall not proceed with next activity until previous activity will be checked and approved by COR. Contractor shall mentioned all inspection dates in the schedule chart

Contractor should keep the site clean and accessible to Embassy employee all time.

The duration of the project shall not exceed **120** working days

### **3. Specifications**

Work under this contract shall be carried out strictly in accordance with specifications attached and will meet US and Local codes.

### **4. Execution of Work**

The Contractors are advised to review the material specifications and scope of work. The Contractor should visit and walk through the site to familiarize themselves with the site conditions to understand the exact quantum of work.

On award of the work, Contractor shall submit all items below via email:

- a. Bar chart within 3 days for approval by the Contracting Officer Representative (COR). All dates and time schedule agreed upon should be strictly adhered to. Contractor shall notify the COR in advance regarding anticipated problems through the project.
- b. Proposed start date
- c. Weekly schedule/activity plan for the duration of the project *prior to the start date*.

For dismantling/blocking or making connection to any existing services or any shut-down, contractor shall inform the COR at least three working days in advance and proceed with the work only after the permission from the COR.

### **5. Materials**

All materials used on this work shall be new and conforming to the contract specifications as per US and local codes.

Materials shall conform to the latest US Standards specifications as amended to date and carry certification mark. Contractor shall submit material samples and catalog for pre-approval.

All materials used on the project shall be approved by the Contracting Officer Representative (COR) before use. Any changes/substitutes on material shall be approved by COR before proceeding.

### **6. Storage of Materials**

All materials shall be stored in a proper manner protected from natural elements so as to avoid contamination and deterioration.

### **7. Site Clearance and Cleanup**

The Contractor shall clear away all debris and excess materials accumulated at the site and dispose of it away from Embassy premises, maintaining a neat site condition.

On completion of project, Contractor shall remove all surplus materials and leave the site in a broom clean condition.

### **8. Workmanship**

Workers working on the site shall be skilled in their job and have related job experience.



**9. Working Hours**

Working hours shall be 8:30 A.M. to 4:30P.M Sunday to Thursday. No work shall be done on Fridays, Saturdays and holidays without the prior approval of the Contracting Officer.

**10. Security Clearance**

The Contractor shall inform and provide in writing transportation details (vehicle registration number, drivers name, and date of delivery) to the COR at least 24 hours in advance for material deliveries.

Contractor shall give workers names at least 3 days in advance to get the security clearance. All the workers shall have an official photo ID or photo ID with the company name on it.

**11. Safety**

Contractor is responsible and shall continue management and implementation of a safety and health program throughout construction.

The Contracting Officer and the Post Occupational Safety and Health Officer [OSHO] reserve the right to suspend work when and where Contractor's safety and health program is considered to be operating in an inadequate or non-complying manner.

Contractor shall provide all Personal Protective Equipment for the workers as per the requirement of the site. Work will be stopped in case the proper protection equipment is not found with the workers and the lapse of time shall be at the Contractor's expense.

Contractor will not leave the work site in an unsafe condition or any other condition that might cause injury to personnel, damage to existing work, plants or equipment.

Contractor will use all safety gadgets e.g. hard hats, cotton gloves and goggles as required on site to avoid the accident.

Any equipment or work considered dangerous shall be immediately discontinued.

**12. Warranty**

The contractor shall guarantee that all work performed will be free from all defects in workmanship and materials and that all installation will provide the capacities and characteristics specified. The contract further guarantees that if, during a period of three years from the date of the certificate of completion and acceptance of the work, any such defects will be repaired by the contractor at his expenses.

## BOQ- Automatic new Irrigation system

Item No#	Description	QTY	Unit Price	Total Price
	IRRIGATION WORKS DESCRIPTION		\$	\$
1	SUPPLY& INSTALL AUTOMATIC CONTROLLER)	1.00		
2	SUPPLY AND INSTALL SELONOID VALVE 1"	4		
3	MAIN VALVE 1"	2		
4	P.V.C PIPES 1"	3		
5	COUPLINGS 1" (ELBOWS AND TEES MALE ADAPTERS)	30PCS		
6	SUPPLY AND INSTALL BACK YARD DRIP IRRIGATION SYSTEM	1		
7	SUPPLY AND INSTALL FRONT YARD DRIP IRRIGATION SYSTEM	1		
8	VALVE BOX	2		
9	SUPPLY OF SPRINKLERS	5		
	Total price for one villa			
	Total for 40 villas			